CLAIMS

1. A power converter system for interconnecting a direct current output device with a three phase power grid, comprising:

first and second converters each comprising a plurality of active, commonly gated switches and associated passive unidirectional current devices, wherein the first converter comprises a three phase input, the second converter comprises a three phase output and each converter is capable of selective, three phase passive and active rectification/inversion;

a direct current bus electrically interconnecting the first and second converters;

an interface to electrically connect the direct current output device to the first converter;

control means, operatively connected to the converter switches, for operating the first converter as a passive unidirectional current blocking element and for operating the second converter as an active inverter;

a three phase isolation transformer comprising primary and secondary sides, wherein the primary side is electrically connected to the second converter; and,

a three phase controllable switch, operatively connected to the control means, for selectively connecting and disconnecting the power converter system from the power grid, wherein the controllable switch has a three phase input side electrically connected to the secondary side of the isolation transformer and a three phase output side electrically connectable to the power grid, whereby current from the direct current output device excites the isolation transformer when the controllable switch is open so that the isolation transformer does not draw current from the power grid, and whereupon closing the controllable switch potential power surges from the power grid to the converter system are minimized.

2. The power converter system of claim 1, wherein the commonly gated switches are integrated gate bipolar transistors, and wherein the passive unidirectional current devices are diodes.

3. The power converter system of claim 1, wherein the direct current output device is grounded and wherein the isolation transformer has a delta-Y configuration comprising a common ground with the direct current output device and with the power grid.

4. The power converter system of claim 3, wherein two of the three input phases of the first converter are electrically connected to each other and to the common ground.

5. The power converter system of claim 1, further comprising converter voltage sensors for each phase, operationally connected to the control means and electrically connected between the input side of the controllable switch and the secondary side of the isolation transformer for monitoring voltage amplitude and phase from the second converter, and grid voltage sensors for each phase operationally connected to the control means and electrically connected to the output side of the controllable switch for monitoring voltage amplitude and phase of the power grid so that the control means can accurately phase and amplitude lock the power converter system to the power grid.

6. The power converter system of claim 1, wherein the direct current output device is a photovoltaic array.

7. A power converter system for interconnecting a photovoltaic array with a three phase power grid, comprising:

first and second converters wherein each converter is capable of selective, three phase passive and active rectification/inversion;

a direct current bus electrically interconnecting the first and second converters;

an interface to electrically connect the photovoltaic array to the first converter;

control means, operatively connected to the converters, for operating the first converter as a passive unidirectional current blocking element and for operating the second converter as an active inverter;

a three phase isolation transformer comprising primary and secondary sides, wherein the primary side is electrically connected to the second converter; and,

a controllable switch, operatively connected to the control means, for selectively connecting and disconnecting the power converter system from the power grid, wherein the controllable switch has a three phase input side electrically connected to the secondary side of the isolation transformer and a three phase output side electrically connectable to the power grid, whereby the isolation transformer does not draw current from the power grid when the controllable switch is open, and whereupon closing the controllable switch potential power surges from the power grid to the converter system are minimized.

8. The power converter system of claim 7, wherein the first and second converters each have a plurality of active, commonly gated switches and associated passive unidirectional current devices.

9. The power converter system of claim 8, wherein the commonly gated switches are integrated gate bipolar transistors, and wherein the passive unidirectional current devices are shunt diodes.

10. The power converter system of claim 7, wherein the photovoltaic array is grounded and wherein the isolation transformer has a delta-Y configuration comprising a common ground with the photovoltaic array and with the power grid.

11. The power converter system of claim 10, wherein the first converter has a three phase input and two of the input phases of the first converter are electrically connected to each other and to the common ground.

12. The power converter system of claim 7, further comprising converter voltage sensors for each phase, operationally connected to the control means, and electrically connected between the input side of the controllable switch and the secondary side of the isolation transformer for monitoring voltage amplitude and phase from the second converter, and grid voltage sensors for each phase, operationally connected to the control means, and electrically connected to the output side of the controllable switch for monitoring voltage amplitude and phase of the power grid so that the control means can accurately phase and amplitude lock the power converter system to the power grid.

13. A method for optimizing integration of a direct current generating device with a three phase power grid, comprising:

providing a power conversion system comprising first and second converters each being capable of selective three phase passive and active rectification/inversion;

connecting a direct current generating device to two grounded phases of the first converter and one remaining phase of the first converter;

electrically interconnecting the converters with a direct current bus;

preventing current flow from the power grid to the direct current generating device when the device is generating insufficient voltage and current by operating the first converter as a blocking diode; and,

providing three phase current for the power grid from the direct current generating device by operating the second converter as a phase locked inverter.

14. The method of claim 13, wherein the direct current generating device is a photovoltaic array.

15. The method of claim 13, further comprising providing the power conversion system with a three phase controllable switch comprising a switch input connected to the system and a switch output connected to the power grid, and monitoring system voltage on each phase independently and adjacent to the switch input and monitoring power grid voltage on each phase independently and adjacent to the switch output for phase and amplitude locking electrical output from the second converter with the power grid.

16. The method of claim 15, comprising electronically connecting an isolation transformer to the power conversion system between the input of the controllable switch and the second converter so that the isolation transformer does not draw current from the power grid when the controllable switch is open, and whereupon closing the controllable switch potential power surges from the power grid to the converter system are minimized.